US-PAT-NO: 4192021

DOCUMENT-IDENTIFIER: US 4192021 A

TITLE: Bone replacement or prosthesis anchoring material

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Abstract Text - ABTX (1):

Bone replacement or prosthesis anchoring material on the basis of sintered calcium phosphates which consists of a mixture of calcium phosphates with low or high-molecular-weight organic substances. More specifically, the anchoring material consists of a mixture of calcium phosphates composed of CaO and P.sub.2 O.sub.5 in a quantitative ratio of 2:1 to 4:1 with biodegradable polymers in a ratio of 10:1 to 1:1 of phosphate to polymer and is implantable as a solid body. A method for the production of the material wherein calcium phosphate with a **porosity of 15 to 30 volume** percent is used and its pores are filled by impregnation with polymer material.

Brief Summary Text - BSTX (5):

The bone replacement or prosthesis materials presently used are either autologous, homoiologous or heterologous bone transplants or implantable parts of metal, metal compounds, polymers or ceramics. However, all these materials have disadvantages when used for the purpose under consideration. The use of autologous bone grafts implies a double operative procedure combined with considerable postoperative pain for the patient. Homoiologous and heterologous bone grafts, metals, polymers and aluminium oxide ceramic are frequently encapsulated by connective tissue, which prevents bone growth in direct contact to the **implant** and thus favours loosening of the **implant**. Further material-dependent reactions are inflammations and foreign-body reactions. In addition, the structure of the above materials as well as that of glass ceramic do not enable resorbable phases to be incorporated, although this would be desirable because it would increase the surface area of the ingrowth region and thus lead to durable **implant**-bone tissue attachment. Another drawback is to be seen in the fact that re-working of the prosthesis during operation is practically impossible.

Brief Summary Text - BSTX (8):

Therefore, it is the object of the present invention to overcome the above drawbacks and to create a partially or completely resorbable, implantable material on the basis of sintered calcium phosphates, which leads to a functionally loadable joint between the bone tissue and the **implant** and in addition enables the bone replacement to be re-worked and adjusted to the individual conditions during the operation. Furthermore, the **implant** should be mechanically stable and permit regeneration of the natural tissue after the **implantation**.

Brief Summary Text - BSTX (10):

The **bone** replacement or prosthetic device can be shaped from the material according to the present invention as block or prosthesis blank and optimally adapted to the given conditions by the surgeon or his assistants during the operation by sawing, cutting, drilling or **milling**. Both the inorganic and the organic constituents of the material covered by the present invention are resorbable and therefore are gradually replaced by endogenic bone tissue.

Brief Summary Text - BSTX (11):

In the case under consideration the material consists of a mixture of calcium phosphates composed of CaO and P.sub.2 O.sub.5 in a quantitative ratio of 2:1 to 4:1 with biodegradable polymers in a ratio of 10:1 to 1:1 of phosphate to polymerizate. It is also possible, however, to **implant** the material according to the present invention as a completely or partially resorbable, kneadable, plastic material. In this case the material consists of a mixture of calcium phosphate with soft, plastic, bioresistant polymerizates, or with the solution of such a polymer in organic solvents or with soft, plastic, resorbable organic materials at a quantitative ratio between 5:1 and 1:1.

Brief Summary Text - BSTX (13):

The bioresistant polymer may be a plastic material which cures after **implantation** by cross-linking or polymerization. On the other hand, however, the polymer may also be dissolved in a solvent, e.g., alcohol, acetone or dimethyl sulfoxide, which is soluble in blood serum. Suitable biodegradable polymers include in particular natural polymers, collagen, fibrinogen and synthetic polymerizates, cyanoacrylate, polyglycolide, polyactide, their copolymers, esters of polymer polyols and their cross-linked products.

Brief Summary Text - BSTX (16):

Depending on its composition, the material according to the present invention may remain plastic or cure after **implantation**. It can be used for both temporary and permanent bone replacement. The degree of resorption of the **implanted** material and its replacement by newly formed endogenic tissue or ingrowth by endogenic tissue depends on the organic constituents used. The objective is in any case to achieve partial replacement or peripheral or complete ingrowth of the **implant** by endogenic tissue.

Brief Summary Text - BSTX (17):

According to an advantageous embodiment of the present invention, solid materials are provided to have continuous pores or pore ducts with an average diameter between 0.6 and 2 mm, at least in the border zone between **implant** and bone tissue. This defined open macropore structure of the **implant** results in an increase in the contact area between bone and **implant** and thus in a wider connection zone. This encourages ingrowth of bone tissue into the prosthetic material and leads to steady resorption of the entire prosthetic material, which is at the same time replaced by the bone tissue.

Brief Summary Text - BSTX (18):

According to another embodiment of the present invention, the material claimed here is calcium phosphate with a **porosity of 15 to 30 volume** percent, whose pores are filled with the polymer material by impregnation. Solidification of the polymer inside the pores can be achieved either by polymerization of the material in the pores of the calcium phosphates or by evaporation of the solvent.

Claims Text - CLTX (2):

2. Bone replacement or prosthesis anchoring material as claimed in claim 1 wherein said material has continuous pores or pore ducts, which have an average width between 0.6 and 2 mm, in the surface area of the **implant**.

Claims Text - CLTX (8):

8. Method for the production of said bone replacement or prosthesis anchoring material as claimed in claim 1 comprising filling the pores of a calcium phosphate body, which has continuous pores or pore ducts with an average width between 0.6 and 2 mm in the surface area of the **implant and has a porosity of 16 to 30 volume** percent, with the melt or solution of a biodegradable polymer or with liquid prepolymers, and solidifying the polymer

by further polymerization in the pores of the calcium phosphate or by evaporation of the solvent.

Claims Text - CLTX (11):

11. Method for the production of said bone replacement of prosthesis anchoring material as claimed in claim 1 comprising mixing calcium phosphate in powder or granular form with a grain size between 0.3 and 2 mm with soft, plastic biodegradable or bioresistant organic materials or polymers or with a solution of a polymer, which, if necessary, cures after the **implantation** of the plastic material by crosslinking or by further polymerization.

US-PAT-NO: 5910173

DOCUMENT-IDENTIFIER: US 5910173 A

TITLE: Implantable article with ablated surface and method of forming same

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Brief Summary Text - BSTX (7):

Porous or irregular surfaces can be provided in implantable articles by a variety of techniques. In some instances irregular surface patterns or surface features are formed in an implantable bone prosthesis by processing techniques such as casting, embossing, chemical etching, **milling** or machining. See, for example, U.S. Pat. Nos. 4,549,319 and 4,624,673. One drawback to using such techniques to provide irregular bone ingrowth surfaces on implantable bone prostheses is the significant amount of processing time required. These processing operations lead to delays in obtaining the finished product and significantly increase the cost of manufacturing the device.

Detailed Description Text - DETX (9):

The average volume porosity of surface ablated parts preferably is about 30 to 90%. Also, the **volume of space** defined by the furrows is greater than the **volume of space** defined by the ridges.

DOCUMENT-IDENTIFIER: US 20020161449 A1

TITLE: Composite bone marrow graft material with method and kit

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Detail Description Paragraph - DETX (10):

[0027] Preferably, the matrix has sufficient porosity to yield at least a 2-fold, preferably 3-fold, preferably 5-fold, preferably 7-fold, preferably 10-fold, increase in total matrix surface area available for progenitor cell-adhesion relative to a nonporous solid having identical external dimensions. Such an increase in total surface area can be achieved by using a matrix substrate comprising powder, granules, fibers, some combination thereof, or a single highly porous substrate mass. Preferably, the size of the pores in the matrix is greater that 20, more preferably 50, more preferably 100, more preferably 500, most preferably 1000 .mu.m, in order to facilitate penetration of progenitor cells through the pore **openings into the void volume** of the matrix material, thereby availing of the additional surface area within the pores.

Detail Description Paragraph - DETX (31):

[0046] Now-enriched matrix 11 is then combined with a volume of clot material 18 as shown in FIG. 4, and the method proceeds similarly as above-described with respect to the first preferred embodiment to produce an implantable composite bone marrow graft material 8 which is effective to induce bone healing or bone regeneration in the graftee. optionally, an additional step can be added to each of the preferred embodiments as described above. Prior to implantation of implantable bone graft material 8, a quantity of non-anticoagulated bone marrow aspirate can be delivered (such as via draining) to the graft material 8 prior to clotting, for example while graft material 8 is in applicator syringe 50. In this manner, liquid aspirate will permeate the **void volume** of graft material 8, ultimately coagulating therein. The aspirate must be delivered to graft material 8 immediately following aspiration to ensure it remains liquid long enough to effectively permeate the material. This step provides additional marrow-derived nucleated cells (including additional progenitor cells) to implantable graft material 8.